Signal Analysis/ March 11th 2021

List of Exercises 2

The file LFP_HG_HFO.mat contains simultaneous recordings of 2 LFP channels (mV) positioned on two different hippocampal layers. These channels have been named lfpHG and lfpHFO. Sampling rate is 1000 Hz.

Write a script to execute the following:

1) Compute the time-frequency decomposition (TFD) of both signals, using 4-second windows with 50% of overlap and a numerical frequency resolution of at least 0.2 Hz.
2) Create two subplots and plot the TFDs of the two signals on them, separately. Use the 'Time (s)' and 'Frequency (Hz)' labels adequately and Y axis limits from 0 to 20 Hz. Use titles on both subplots to indicate which channel is being plotted.
3) From both TFDs, compute the time series of average theta (6-10 Hz) power. Plot those series on two different subplots.
4) Use a scatter plot to show values of theta power from both channels through time.
5) (Optional) Compute and plot a linear fit from the data shown on 4).
6) (Optional) Compute the Pearson correlation between the theta power time series and print the value obtained.
7) Find the peak frequency on the theta range (6-10 Hz) for each channel in each TFD window. Plot the time series of these frequencies for both channels in the same subplot (2,1,1). On another subplot (2,1,2), plot the histogram distribution of the peak theta frequencies of both channels.
8) Repeat what was done for questions 4 to 6, but, instead of theta power, use the time series of theta frequencies.